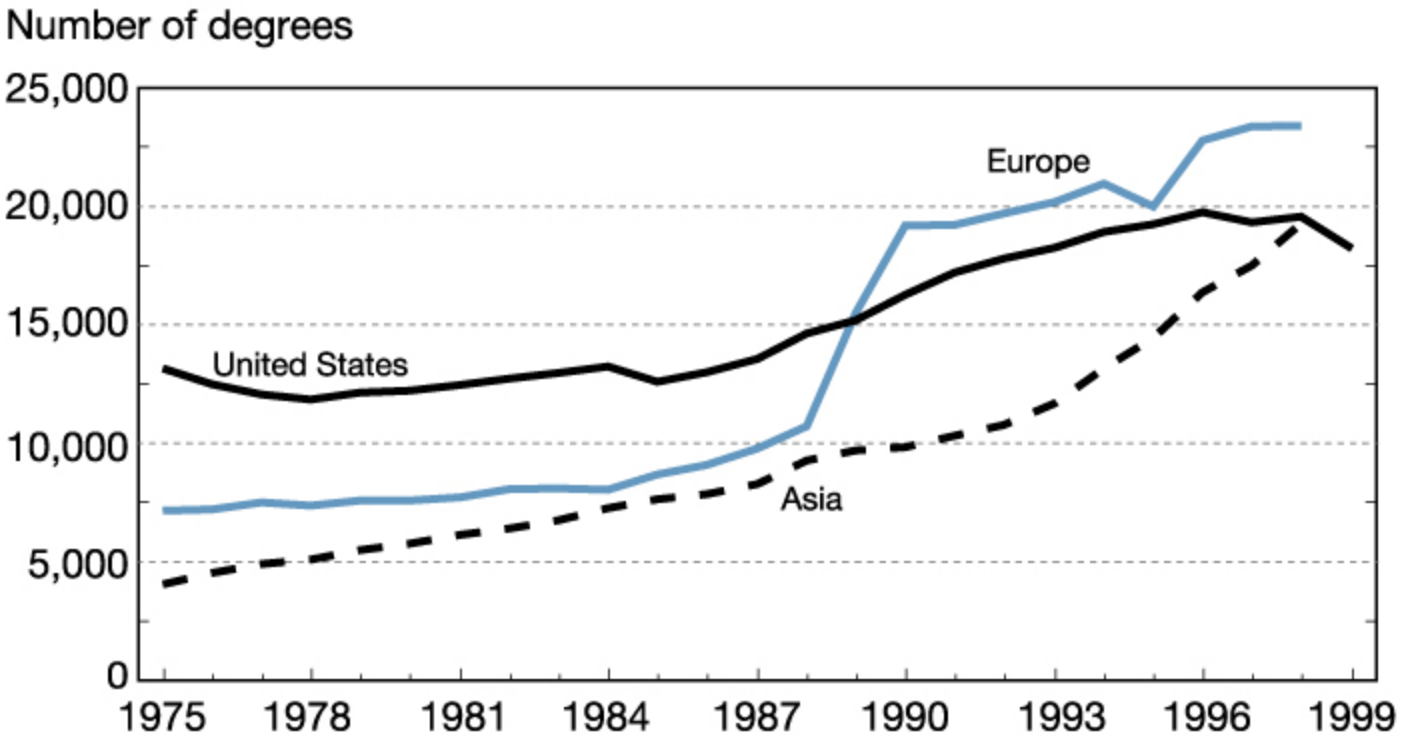
Women in Materials Research & Education: Looking Back, Racing Forward

Zakya H. Kafafi
Director, Division of Materials Research (DMR)
National Science Foundation

Women's Breakfast Presentation at MRS Fall Meeting
December 3, 2008

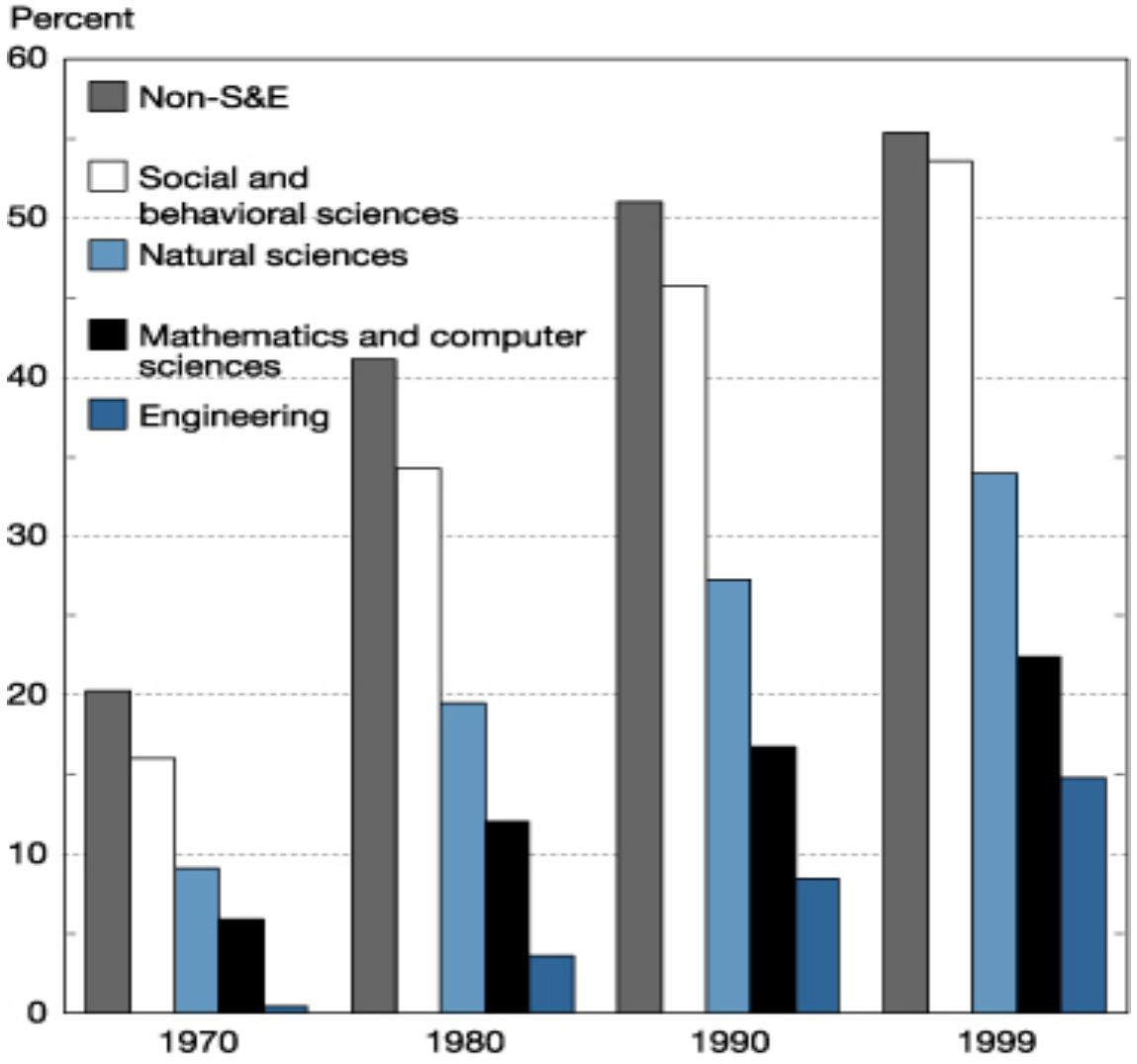
Europe and Asia outpace the U.S. in production of Science and Engineering (S&E) PhDs



NOTE: Europe includes France, Germany, and the United Kingdom. Asia includes China, India, Japan, South Korea, and Taiwan.

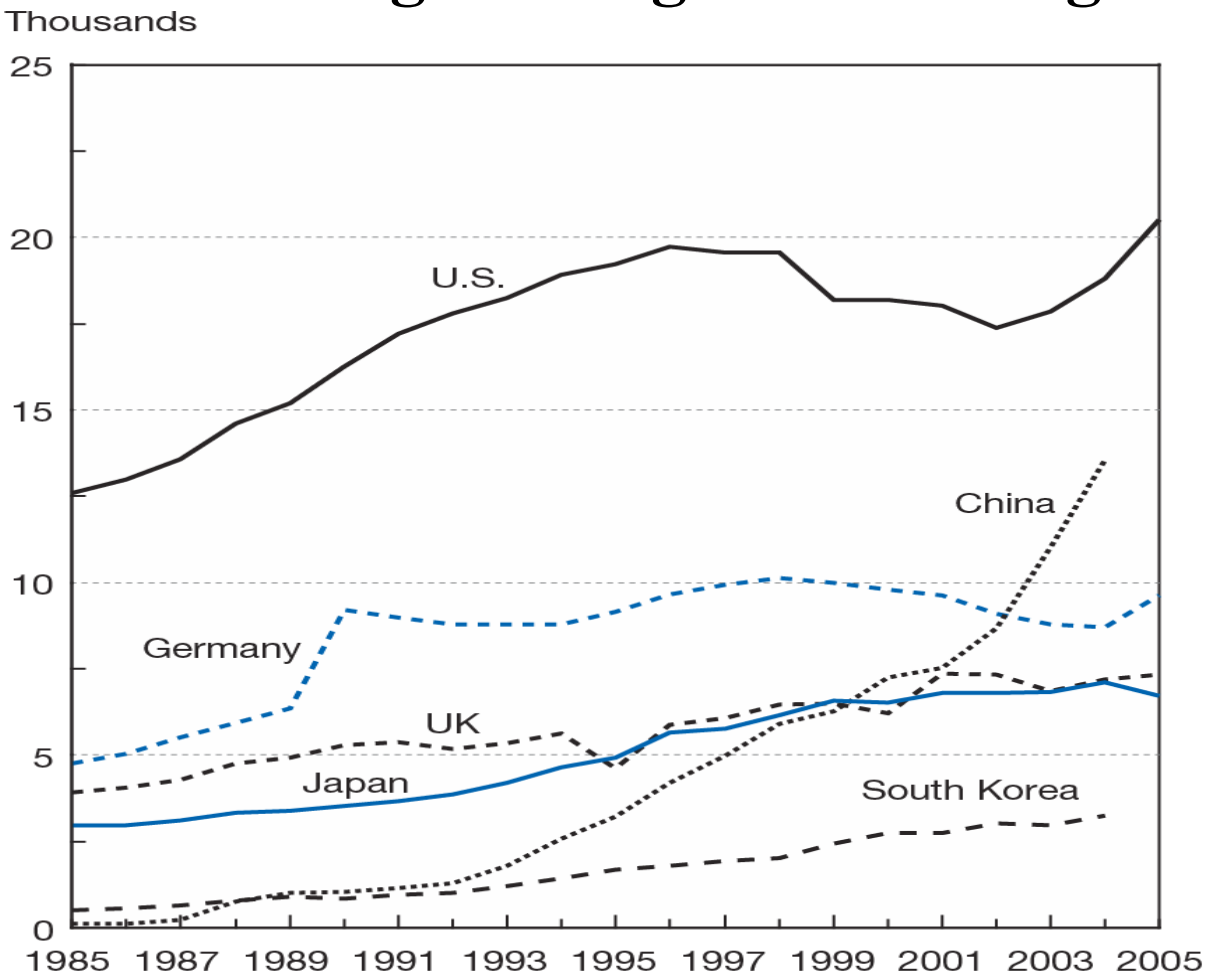
SOURCE: National Science Board. *Science and Engineering Indicators - 2002.*

Doctoral degrees earned by women in U.S. institutions, by field: 1970-99



SOURCE: National Science Board. *Science and Engineering Indicators - 2002.*

Natural sciences & engineering doctoral degrees: 1985–2005

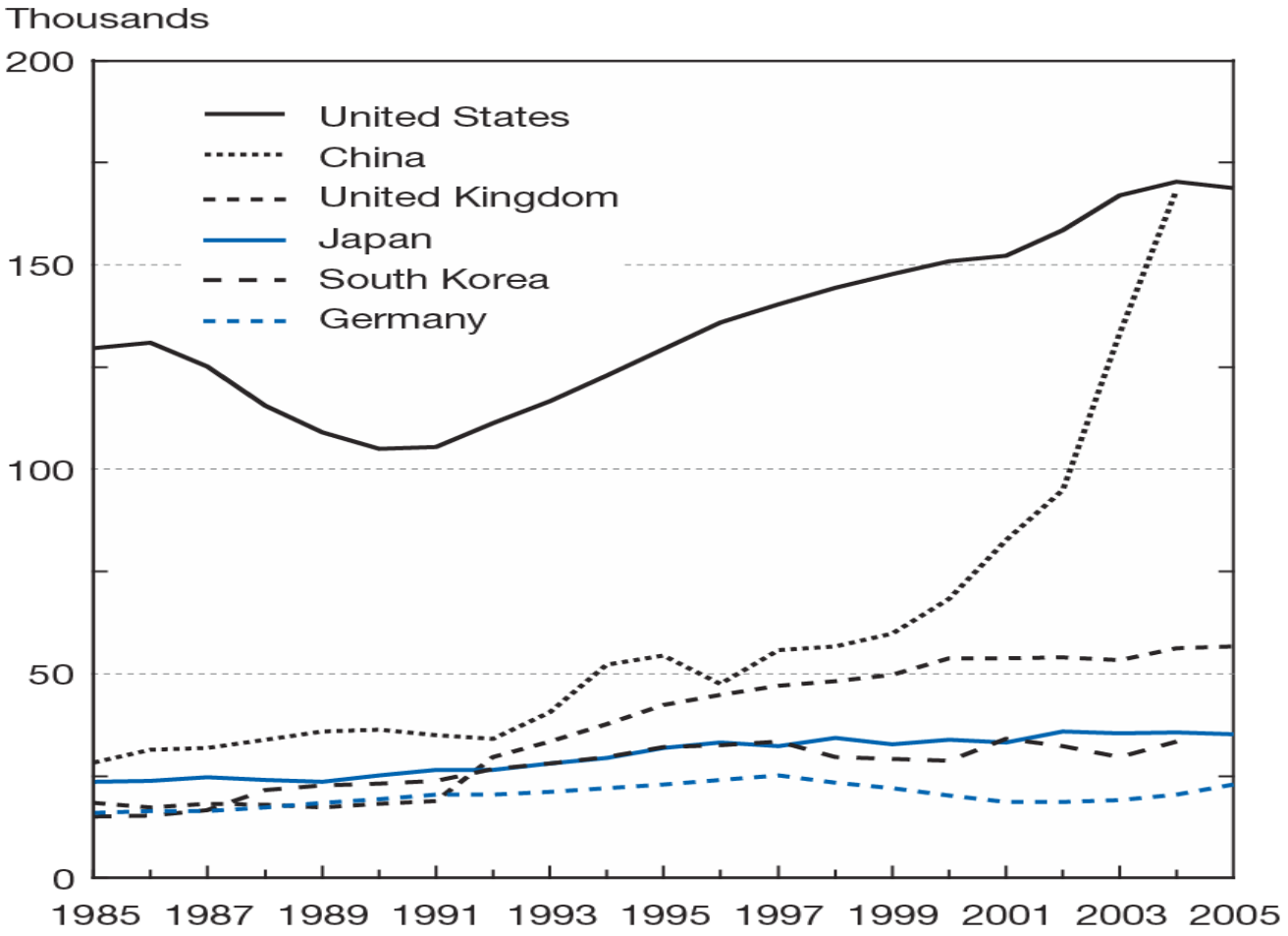


UK = United Kingdom

NOTE: Natural sciences and engineering include physical, biological, earth, atmospheric, ocean, agricultural, and computer sciences; mathematics; and engineering.

SOURCE: National Science Board. *Science and Engineering Indicators - 2008.*

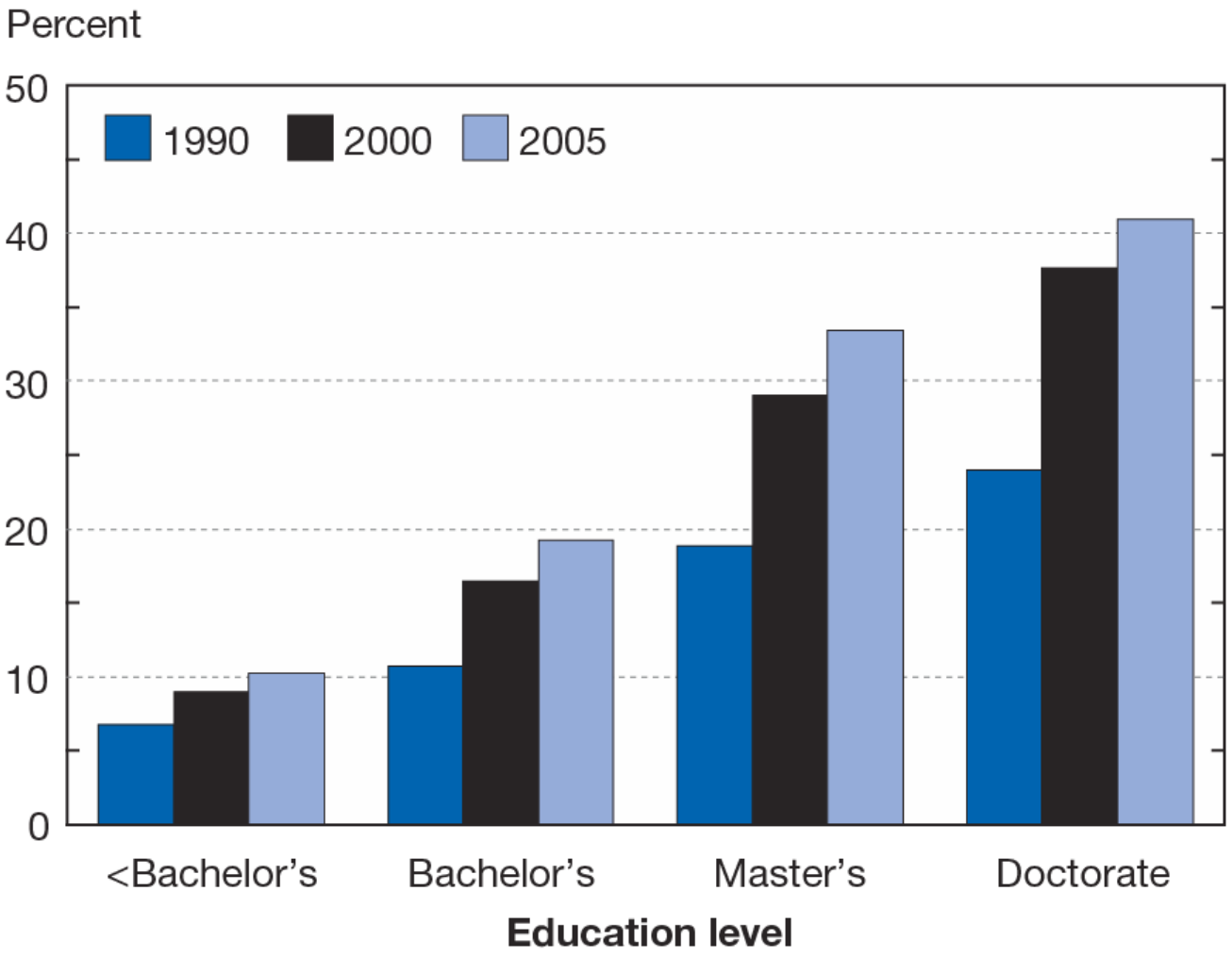
First university natural sciences degrees: 1985–2005



NOTES: Natural sciences include physical, biological, earth, atmospheric, ocean, agricultural, and computer sciences and mathematics. German degrees include only long university degrees required for further study.

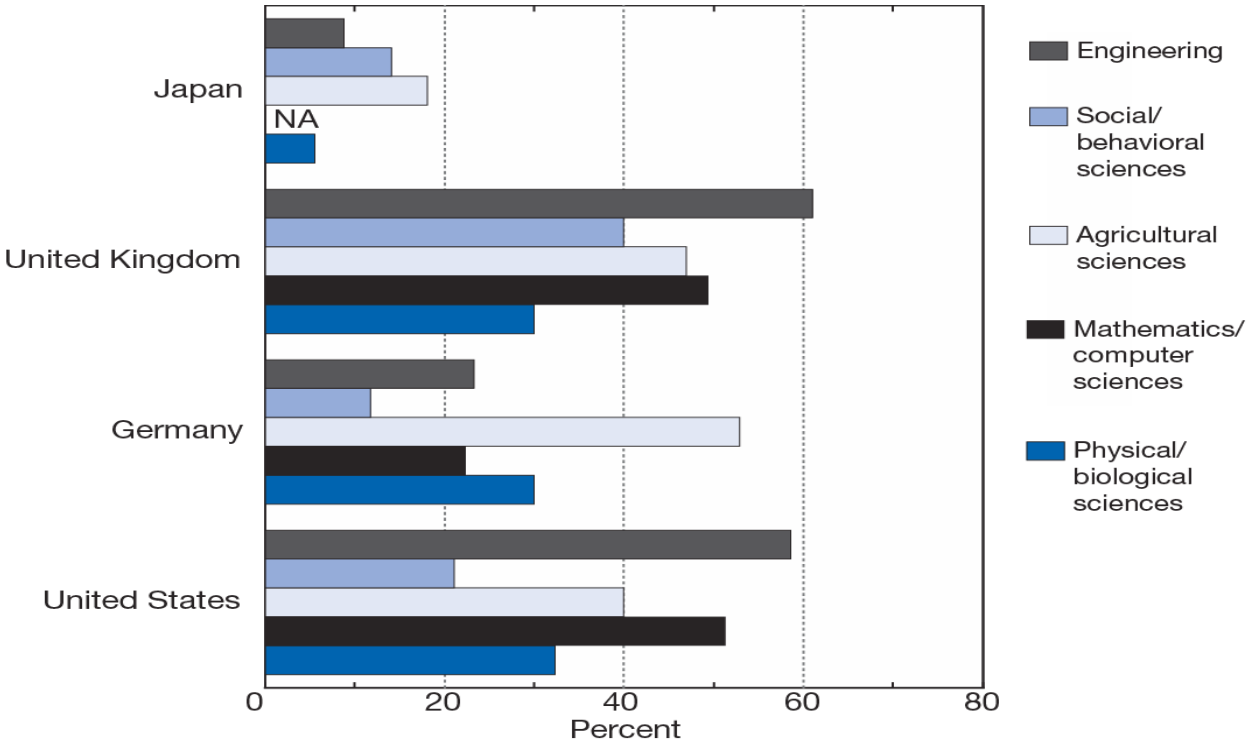
SOURCE: National Science Board. *Science and Engineering Indicators - 2008.*

Foreign-born individuals in U.S. S&E workforce, by degree level: 1990, 2000, and 2005



SOURCE: National Science Board. *Science and Engineering Indicators - 2008*.

S&E doctoral degrees earned by foreign students, by selected industrialized country and field: 2005*

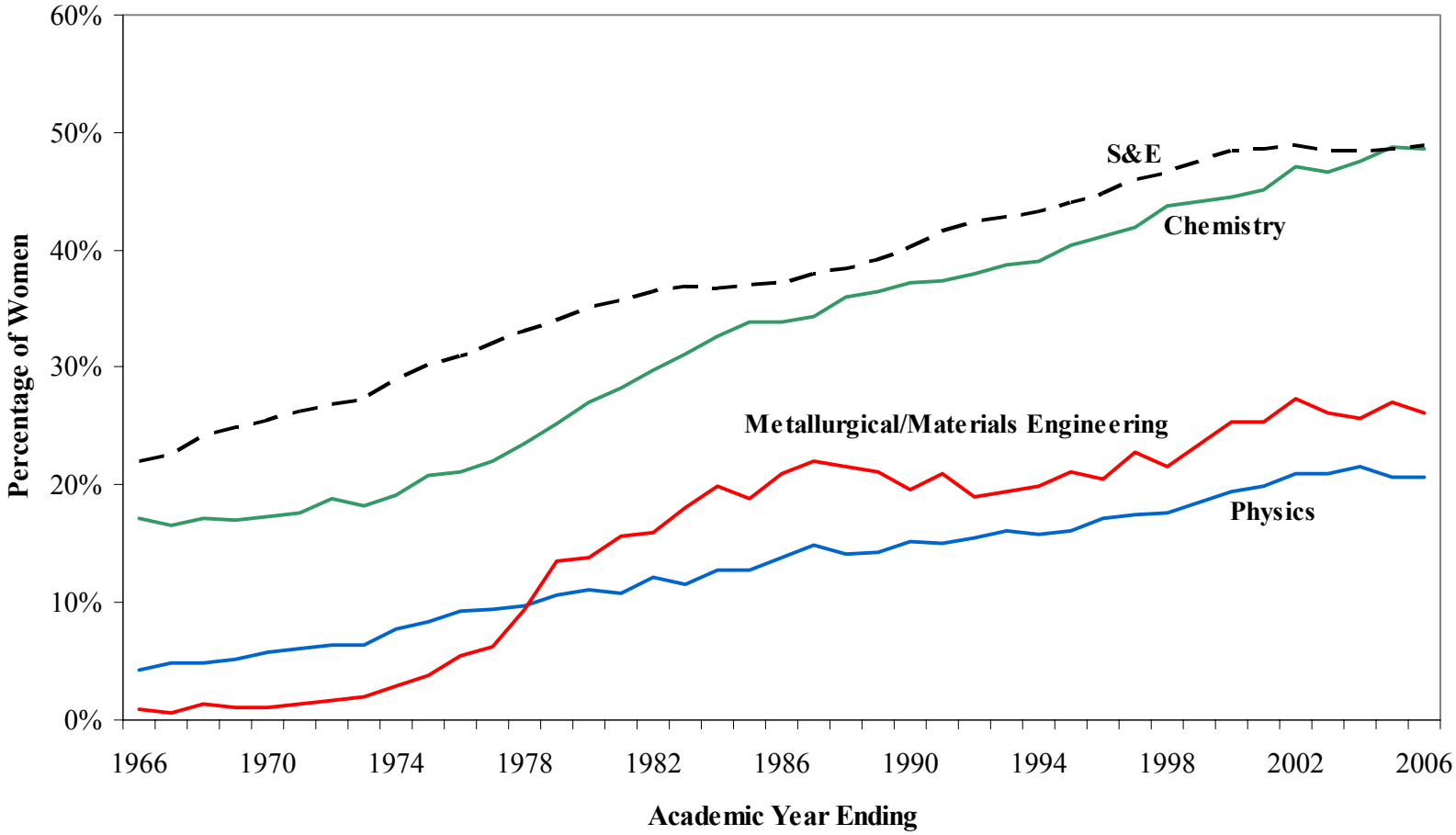


* or most recent year

NOTES: Physical sciences include earth, atmospheric, and ocean sciences. Japanese data for university-based doctorates only; exclude *ronbun hakase* doctorates awarded for research within industry. Japanese data include mathematics in natural sciences and computer sciences in engineering. For each country, data are for doctoral recipients with foreign citizenship, including permanent and temporary residents.

SOURCE: National Science Board. *Science and Engineering Indicators - 2008.*

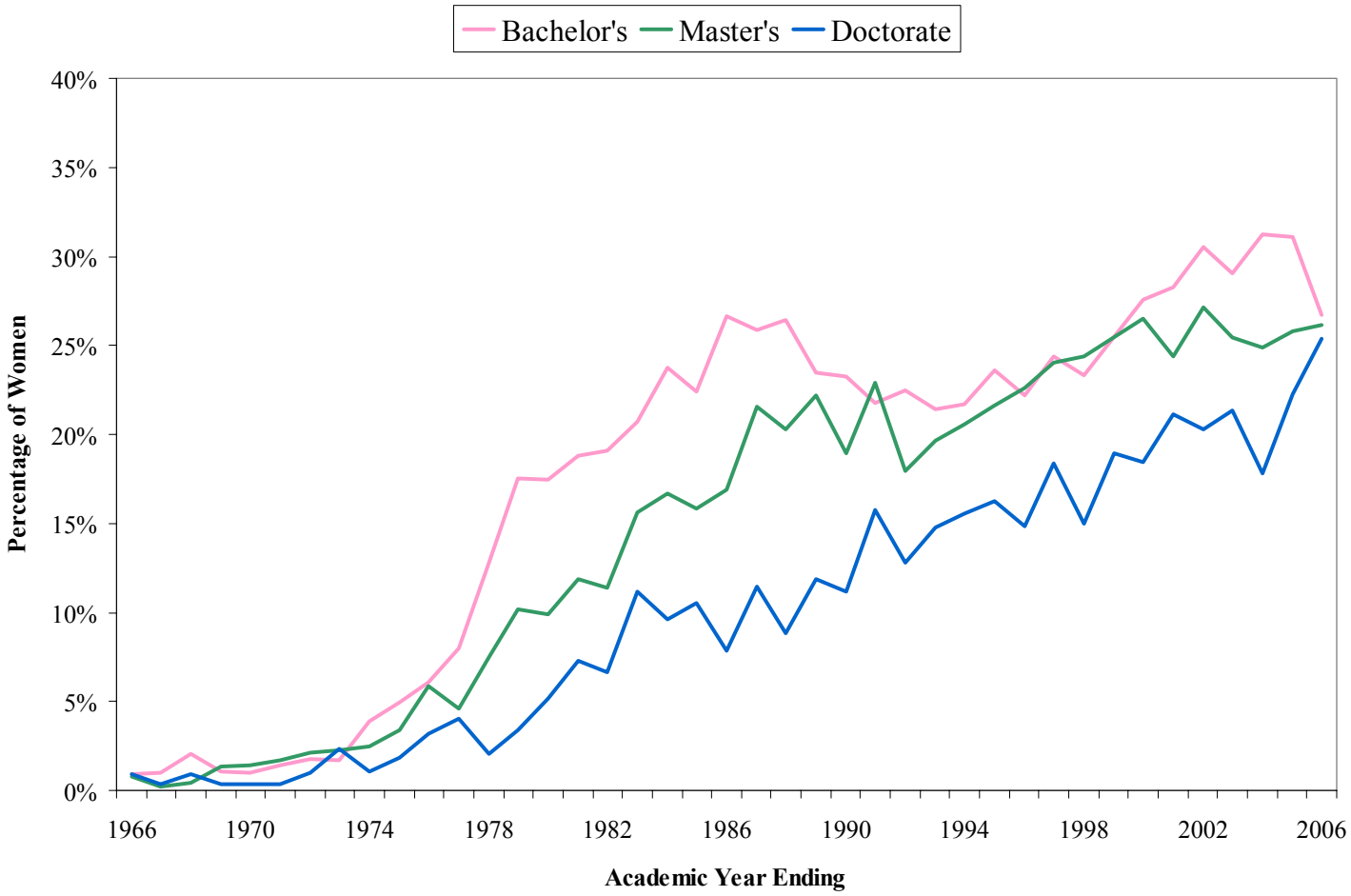
Percentage of all degrees awarded to women in S&E, in chemistry, physics, and materials and metallurgical engineering: 1966-2006



NOTE: Detailed national data were not released by the National Center for Education Statistics for Bachelor's and Master's recipients for the academic year ending in 1999. Data point for 1999 was interpolated.

SOURCE: National Science Foundation, Division of Science Resources Statistics. 2008. Science and Engineering Degrees: 1966–2006. Detailed Statistical Tables NSF 08-321. Arlington, VA. Available at http://www.nsf.gov/statistics/nsf08321/.

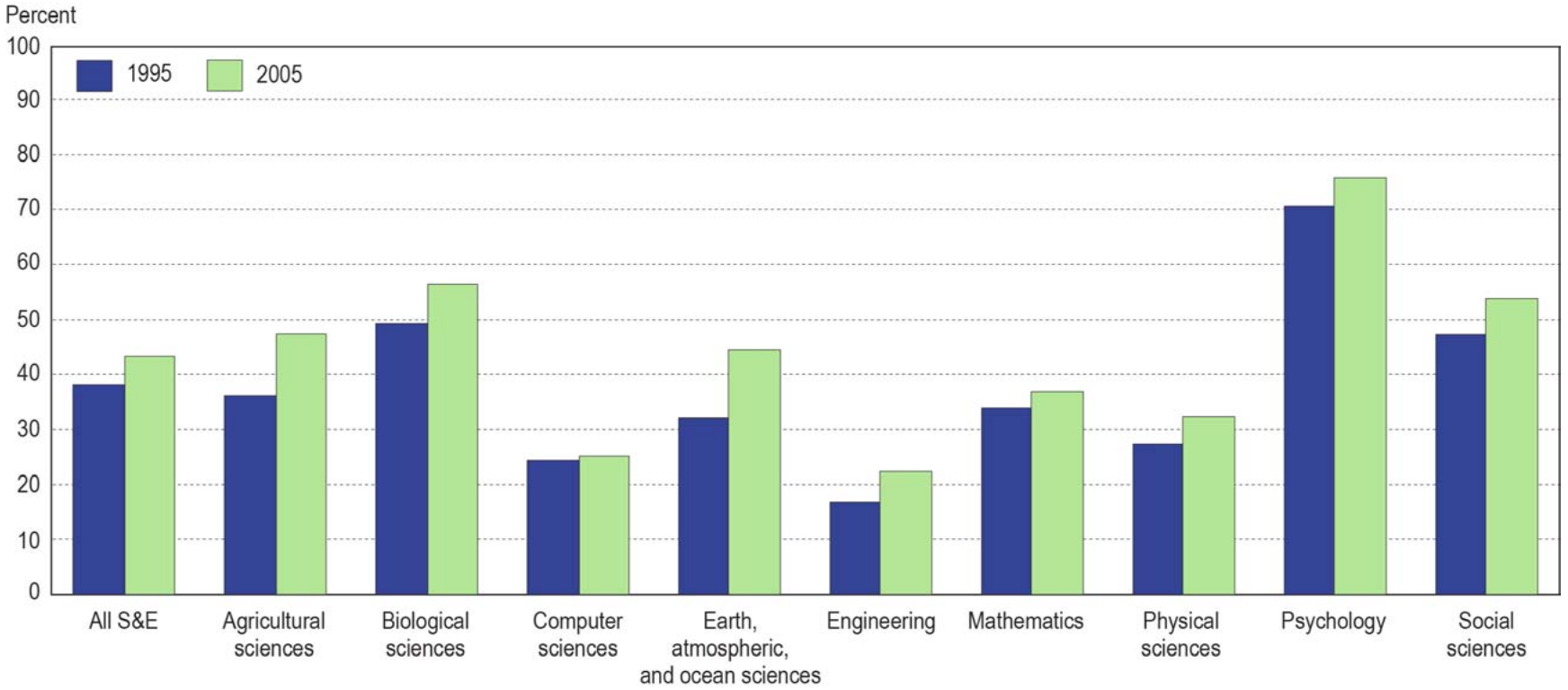
Materials and metallurgical engineering degrees awarded to women, by degree level of recipient: 1966–2006



NOTE: Detailed national data were not released by the National Center for Education Statistics for Bachelor's and Master's recipients for the academic year ending in 1999. Data point for 1999 was interpolated.

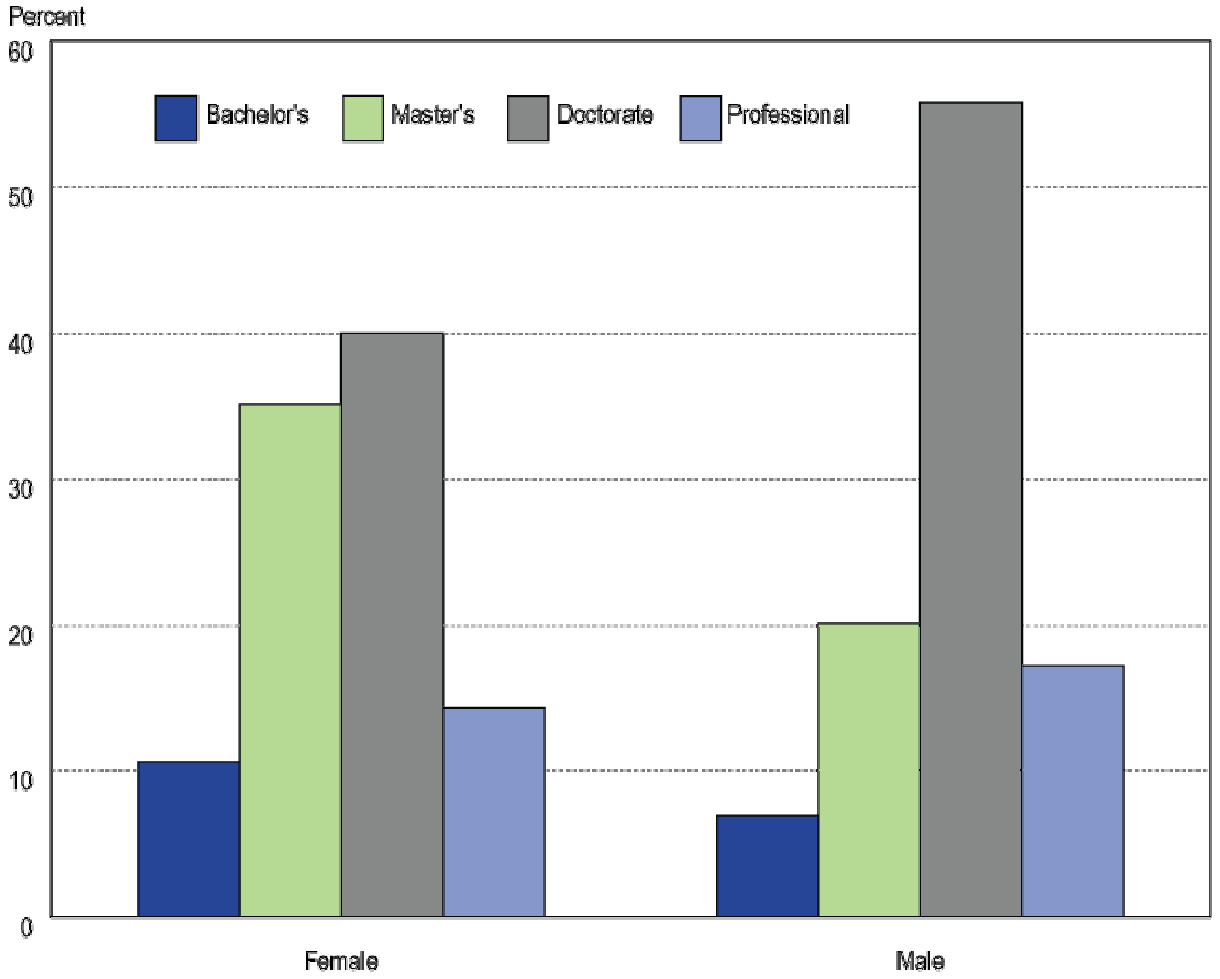
SOURCE: National Science Foundation, Division of Science Resources Statistics. 2008. Science and Engineering Degrees: 1966–2006. Detailed Statistical Tables NSF 08-321. Arlington, VA. Available at http://www.nsf.gov/statistics/nsf08321/.

Female share of S&E graduate students, by field: 1995 and 2005



SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering (October 2007)*

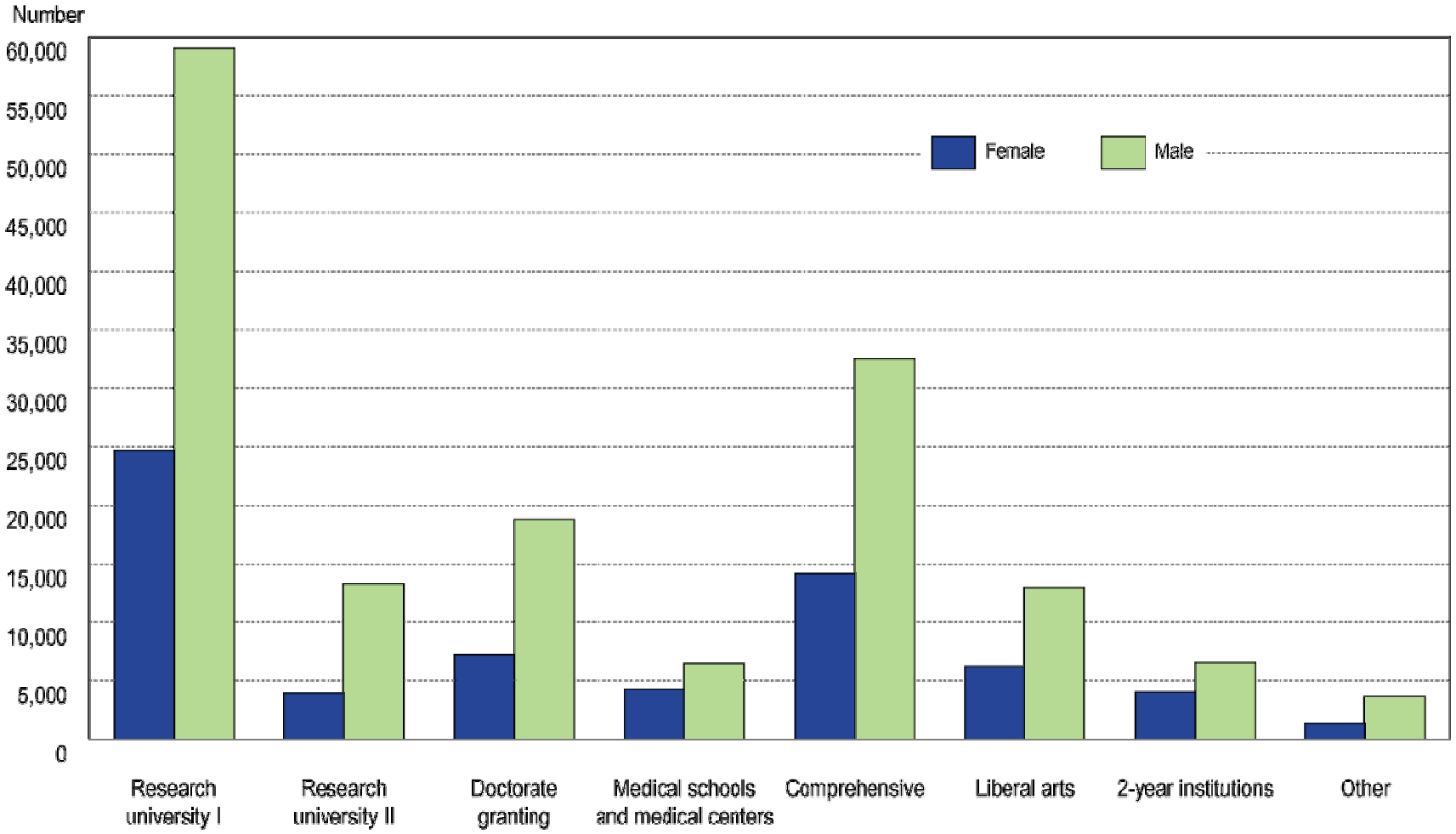
Science and engineering faculty, by sex and highest degree: 2003



NOTE: Includes full, associate, and assistant professors and instructors.

SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering (December 2006)*

Doctoral science and engineering faculty, by sex and Carnegie classification of employer: 2003



NOTE: Includes full, associate, and assistant professors and instructors.

SOURCE: *Women, Minorities and Persons With Disabilities in Science and Engineering (December 2006)*

The NSF ADVANCE Program 09-504

Program Goal: Increase the participation and advancement of women at all levels in academic science and engineering careers.

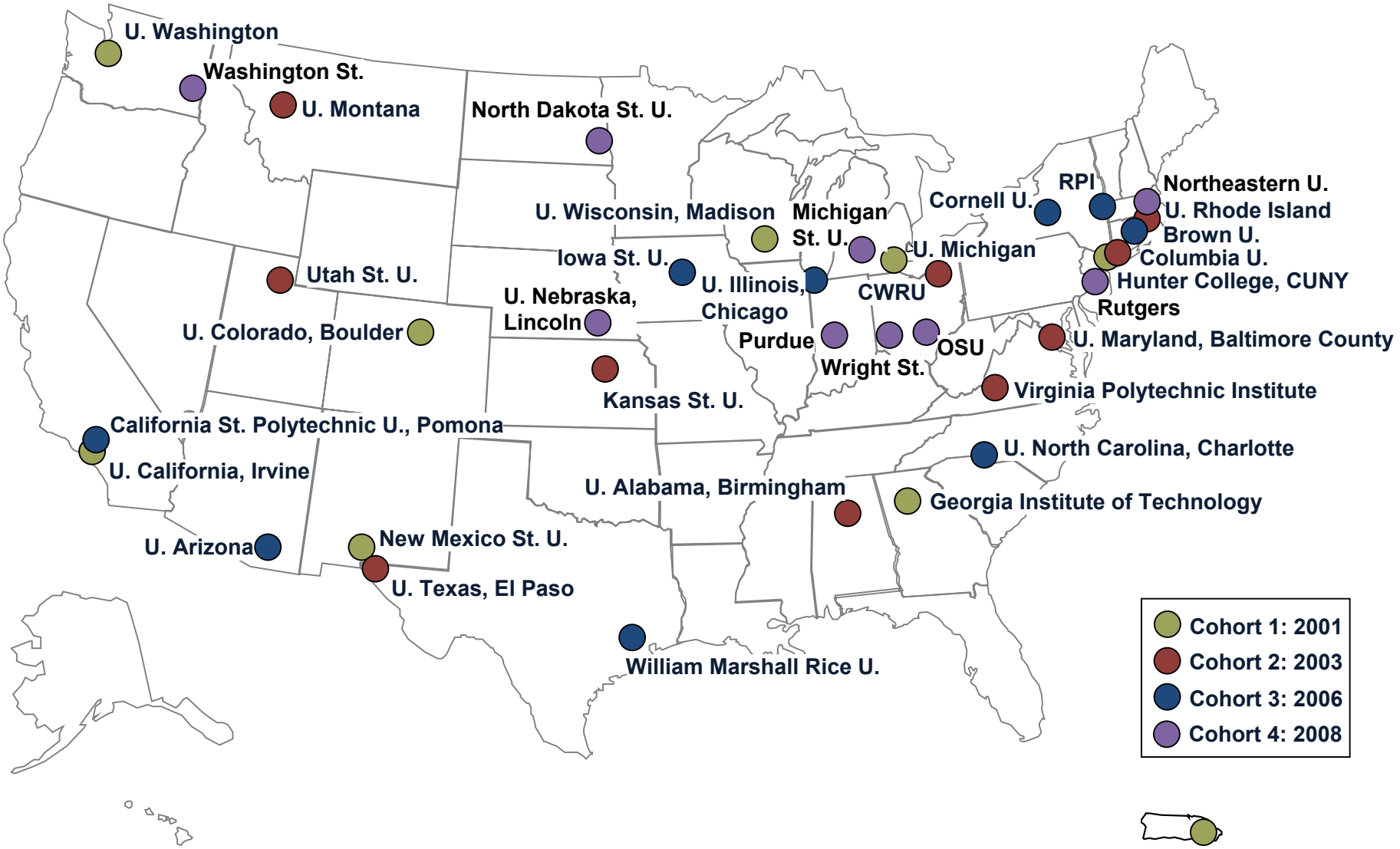
- Creative strategies to realize this goal should involve and are sought from both men and women

There are three program components:

- Institutional Transformation: 5 year comprehensive institution-wide projects
- IT-Catalyst: 2 year institutional self-assessment projects
- Partnerships for Adaptation, Implementation, and Dissemination (PAID): Projects to adapt proven strategies, perform research on gender in academics, and diffuse proven information, tools, and materials to appropriate audiences

- **Letters of Intent for PAID due January 20, 2009**

ADVANCE Institutional Transformation Grantees 2001-2008



Courtesy of NSF ADVANCE Program

WISELI

Women in Science & Engineering Leadership Institute
University of Wisconsin-Madison

- **Award**: 5-Year $3,750,000 NSF ADVANCE Institutional Transformation Grant, January 2002 – January 2007
- **Objective**: To promote institutional transformation in science and engineering fields by increasing the participation, success and leadership of women faculty in academic science and engineering.
- **Constituents**: **70 departments/units** and **1,200 faculty** in the biological and physical sciences in **six schools** – College of Engineering, College of Letters & Sciences, College of Agricultural and Life Sciences, the School of Veterinary Medicine, the School of Pharmacy, and the School of Medicine and Public Health

WISELI
Women in Science & Engineering Leadership Institute
University of Wisconsin-Madison

- **Initiatives**:
  - **Grant Programs**
    - Vilas Life Cycle Professorship Program
    - Celebrating Women in Science & Engineering Grants
  - **Workshops**
    - Workshops for Search Committee Chairs
    - Climate Workshops for Department Chairs
    - Workshops for PIs on Building Effective Research Teams (in development)
  - **Other Initiatives**
    - Conversion of staff to tenure track
    - Awards and honors for women faculty
    - Leadership development for academic staff
    - Conversations with senior women faculty
    - Documentary video
    - WISELI Seminar series
    - WISELI website, listserv

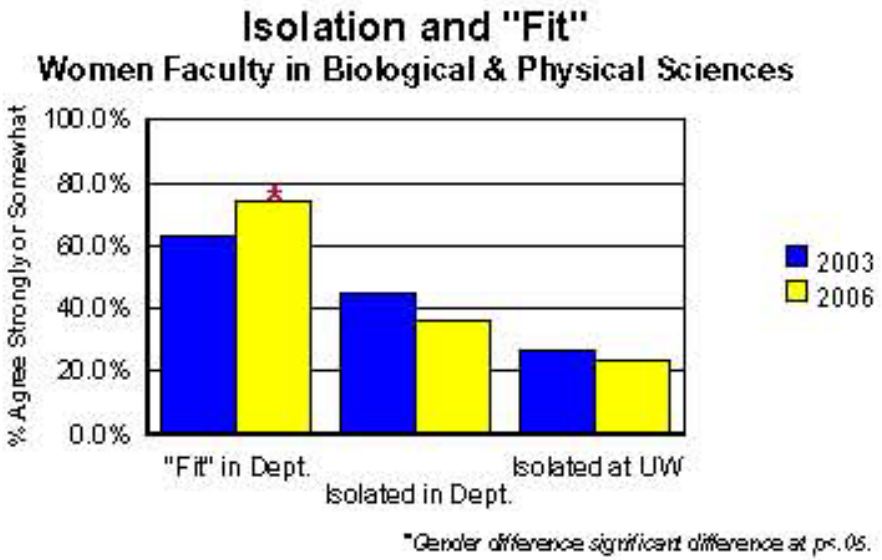
- **Research Activities:**
  - **Evaluative Research**
    - Interviews with women faculty and staff
    - Study of Faculty and Academic Staff
    - Worklife (climate survey)
    - Resource studies
    - Issue Studies
    - Evaluation of existing programs at UWMadison
  - **Other Research**
    - Discourse analysis of women's communication strategies
    - Ethnographic study of gendered interactions in the laboratory setting
    - Study of Career Choices in Engineering
    - Expanding Entrepreneurial Activity for Senior Women

NSF

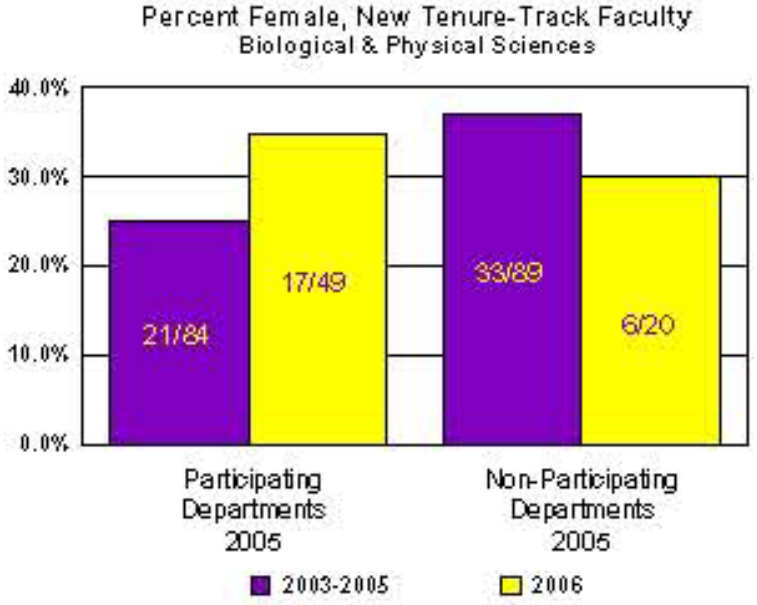
Impact of NSF ADVANCE at University of Wisconsin-Madison

Selected Results

Climate



Hiring

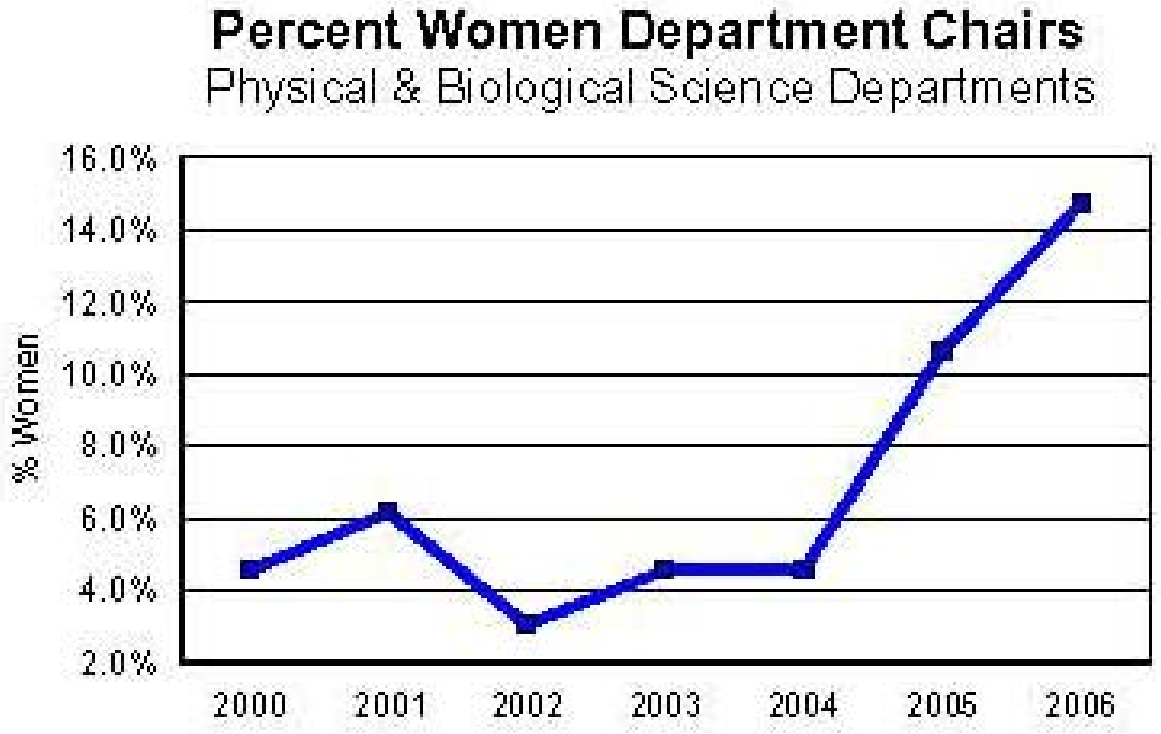


WISELI
Women in Science & Engineering Leadership Institute
University of Wisconsin-Madison

NSF

Impact of NSF ADVANCE at University of Wisconsin-Madison

Leadership



WISELI
Women in Science & Engineering Leadership Institute
University of Wisconsin-Madison

NSF

General Lessons for Department Chairs

- Implement standardized and transparent departmental policies and procedures
- Collect departmental and relevant national data, and share it with the department
- Support formal mentoring inside and outside the department
- Develop programs supportive of work-life balance
- Establish a culture that encourages active women participation
- Focus on changing the department to achieve equity, not "changing the individuals" to suit the department

Lessons for Department Chairs: Recruitment

- Establish departmental expectations for diversity
- Require candidate pools that reflect the available pool
- Create broader position announcements to widen the pool of qualified candidates
- Select a diverse and knowledgeable search committee
- Train search committee chairs and members on implicit bias, etc.
- Require documentation be reported on each search (e.g., committee composition, demographics of candidates interviewed, reasons for hire decision, etc.)
- Highlight work-life balance programs and policies to all candidates

Lessons for Department Chairs: Promotion & Tenure

- Publish tenure and promotion requirements
- Mentor junior faculty (mentors include department chair and faculty inside and outside of the department)
- Develop multiple mentors for faculty, a mentoring circle
- Implement pre-tenure review
- Actively encourage faculty to pursue promotion
- Select a well-balanced promotion & tenure committee
- Train committee on implicit bias, etc.
- Assign service and teaching demands equitably
- Encourage all faculty to take advantage of available work-life balance programs (stop the clock policies, etc.)
- Ensure promotion & tenure decisions are not negatively influenced by these programs

DMR Sponsored Workshops in 2008/9

Ultimate Goal

To Develop a Diversified Materials Research & Education Workforce

- Materials Science and Engineering Gender Equity Workshop, Adelphi, MD, May 18-20, 2008
- Materials Science and Materials Engineering Education Workshop, Arlington, VA, September 18-19, 2008
- Workshop on Excellence Empowered by a Diverse AcademicWorkforce: Chemists, Chemical Engineers and Materials Scientists with Disabilities, Arlington, VA, February 8-10, 2009

MSE Gender Equity Workshop*

May 18-20, 2008

University of Maryland Conference Center, Adelphi, MD

http://www.mse.uiuc.edu/gender/index.htm

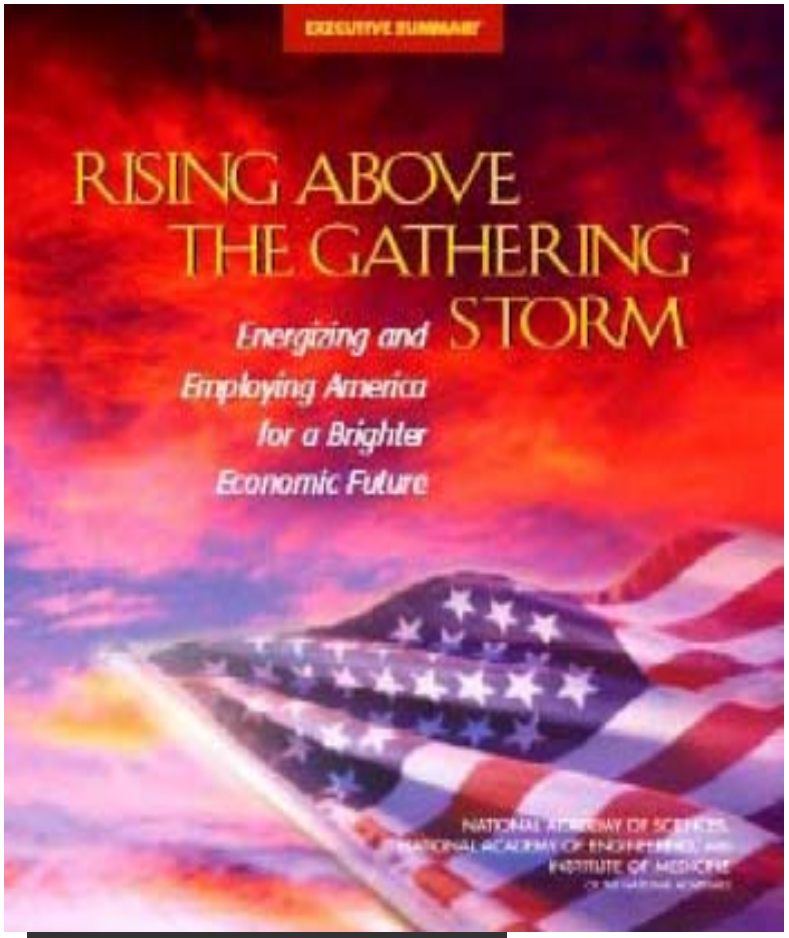
Goal: Understand key issues of gender equity in MSE departments and develop strategies to foster an inclusive workplace environment

- Topics included current status, understanding biases, balancing work and family life, improving the workplace environment, etc.
- ~100 Participants: from academia, National labs., funding agencies
- A report was just published

* Held at the annual meeting of University Materials Council

* Sponsors: NSF (DMR & ENG), DOE-BES,UMC, and UIUC MSE department

National Academies' Committee on Prospering in the Global Economy of the 21st Century: Recommendations



- 10,000 teachers, 10 million minds, and K-12 science and mathematics education
- Sowing the seeds through science and engineering research
- Best and brightest in science and engineering higher education
- Incentives for innovation

Something Missing?

- **2006**: Senators Kennedy, Clinton, Mikulski, and Murray requested a follow-up study from The Academy of Sciences to focus on underrepresented groups in STEM
- **2007**: Support in both House and Senate for the study which is mandated in the America COMPETES Act

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

NSF

Committee on Capitalizing on the Diversity of the Science and Engineering (S&E) Workforce in Industry

Nicholas Donofrio (IBM) and Ann Lee (Genetech), Co-Chairs

- Conduct a study on how to maximize the recruitment, retention, and advancement of women and underrepresented minorities in industries that have a large S&E component
- Develop findings, identify best practices, and provide recommendations to guide industry policy makers

Follow on to Beyond Bias and Barriers:
Fulfilling the Potential Women in Academic Science and Engineering (COSEPUP) 2006

Project Schedule

- February 2008: Committee formed
- Three Committee Meetings: March, June, October 2008
- Template for consensus report
- November 2008-February 2009: Draft Report
- March-May 2009: External Review
- Summer/Early Fall 2009: Report Release and Dissemination

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

NSF

Pathways to STEM
Science - Technology - Engineering - Mathematics

Funding provided by:
National Science Foundation

Science, Technology, Engineering, & Mathematics (STEM) Education & Careers

IBParticipation.org is a portal website supporting pathways to the STEM fields: science, technology, engineering, and mathematics.

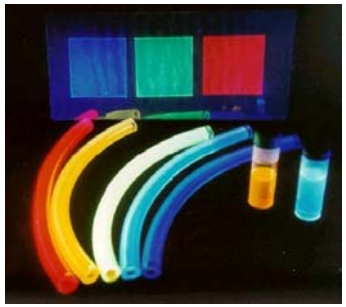
Particular emphasis is placed on connecting traditionally underrepresented groups with STEM programs and resources, including funding and mentoring opportunities.

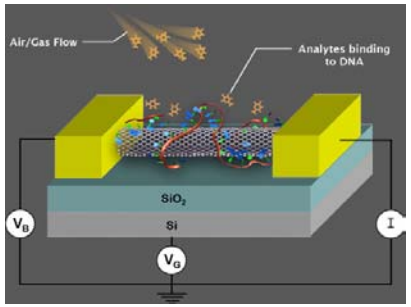
New!
The National Science Foundation's New Broadening Participation Page
including the August 2008 Strategic Report
Click Here

contactus@ibparticipation.org 1-866-593-9103 Damariscotta, ME 04543

Partnership for Research & Education in Materials (PREM)

….broaden participation in materials research and education by stimulating the development of *long-term, collaborative partnerships between minority serving institutions and DMR-supported groups, centers and facilities.*

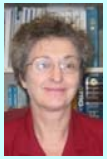


- 10 PREMs currently funded ~ 500k/year for 5 years (http://mrsec.org/prem/)
- **New PREM competition: Proposals Due March 5, 2009**
  Solicitation: NSF 09-518
- Expanded to **institutions primarily serving women and people with disabilities**
- Partner with DMR supported centers, groups or facilities

Division of Materials Research (DMR)

OFFICE of the DIVISION DIRECTOR


Zakya Kafafi
Division Director


Carmen I. Huber
Executive Officer (Acting)


Neila Odom-Jefferson
Operations Specialist

VACANT
Division Secretary


My Di Le
STEP Student

Administrative Unit

Manager


Carol Savory-Heflin

Program Support


Denese Logan
Analyst


Bill Daniels
Specialist

Senior Program Assistants


Deborah E. Dory


Renee Ivey


Shirley Millican


Bernie Trumble

Program Directors

Biomaterials (BMAT)


Joseph A. Akkara


David A. Brant

VACANT

Ceramics (CER)


Lynnette D. Madsen

Condensed Matter & Materials Theory (CMMT)


Daryl W. Hess

VACANT

VACANT

Condensed Matter Physics (CMP)


Oscar O. Bernal


Wendy Fuller-Mora


Udo Pernisz
Dow Corning

VACANT

Electronic and Photonic Materials (EPM)


LaVerne D. Hess


Z. Charles Ying

Instrumentation for Materials Research (IMR)


Charles Bouldin

Materials Research Science & Engineering Centers (MRSEC)


Thomas P. Rieker


Rama Bansil
Boston U.

VACANT

Metallic Materials and Nanostructures (MMN)


Harsh D. Chopra
SUNY

VACANT

National Facilities (NAF)


Guebre X. Tessema

Office of Special Programs (OSP)


Danielle Finotello


Uma Venkateswaran

Polymers (POL)


Andrew J. Lovinger


Freddy Khoury

Solid-State & Materials Chemistry (SSMC)


Linda Sapochak

VACANT